

## **ODOT Research Advisory Committee Meeting**

March 8, 2016, 1:30 – 4:20

Diamond Lake Conference Room – TLC

### **Attendance:**

RAC Voting Members: Bob Bryant, Tom Lauer, Jerri Bohard, Scott Ashford, Troy Costales, Tom McClellan, Luci Moore, Hal Gard, and Chris Monsere

RAC Non-Voting Members: Hau Hagedorn (filling in for Jennifer Dill) and Jasmine Harris

ODOT Staff: Michael Bufalino, Matthew Mabey, Tony Knudson, Xiugang (Joe) Li, Norris Shippen, Mark Joerger, Jon Lazarus, Kira Glover-Cutter, and Linda Perkins

### **Introductions:**

The meeting began at 1:30 p.m. with introductions of RAC Members and Research Staff and an overview of changes made in the Research Staff regarding Lyn Cornell retiring and Joe Li will be presenting for the Active and Sustainable Transportation ETG, Kira Glover-Cutter now chairing the Geotechnical, Hydraulics, & Environmental ETG, and Matthew Mabey now chairing the Structures ETG.

### **Expert Task Group (ETG) Reports:**

Michael Bufalino reviewed the projects progress from last year's selection and where Research stands for this year's number of projects to be funded. During the last year 4 extra projects were funded. One of those projects, the Durable Edge Line Pavement Markings project, did not get started and another project, Preventing the Remobilization for Captured Metals in Stormwater Treatment Systems needed the scope reduced from a 4 years project to a 2 year project but was never able to be contracted. So the project is in the process of being cancelled. That ended with extra funds available funding being available for a large start up in FY 17, but there are limited funding concerns for projects continuing on in FY 18 which may limit the projects going forward from 9 to 11 depending on the scope and funds required for each.

The ODOT research coordinators provided an overview summary of the stage 2 problem statements that were identified by each Expert Task Group (ETG). Projects were presented by task group and ranking according to the ETGs. A summary of the discussion of the problem statements follows:

#### **Active and Sustainable Transportation (AST) – Joe Li**

The ETG ranking of this year's Stage 2's is 17-036 first, 17-038 second, and 17-039 third.

#### **17-036 Statewide Data Standards to Support Current and Future Strategic Public Transit**

The goal of this research project is to develop a public transit ridership data standard for all Oregon public transit agencies to follow for the purposes of improved data collection, storing, sharing, reporting, and analysis. These core functionalities of the standard will be supported with the development of open-source, web-based tools for use by transit agencies, ODOT, regional planners, modelers, and vendors.

**RAC discussion:** The discussion was how this information (data standard) will be used and what is the research aspect of it is. The standard once developed will be available and measureable to all agencies as they choose to utilize this and for the smaller service providers and districts this will aid to get them away from the Excel spreadsheets and become more standardized. The research piece would be to develop the standard.

### **17-038 Compliance and Surrogate Safety Measures for Uncontrolled Crosswalk Crossings in Oregon**

The objective of this research is to analyze, as robustly as possible, the effectiveness of field measurements and surrogate safety measures to develop a proactive approach to evaluate crosswalk safety performance. The proposed research aims to answer these questions: (1) Can surrogate safety measures be used as a reliable predictor of a crosswalk expected safety performance? (2) Is possible to utilize field-based surrogate safety measures as a tool to examine the need of crosswalk improvements?

**RAC discussion:** The discussion indicated that there should be a bicycle component added to the project to measure bike and pedestrian data.

### **17-039 Freight Data to Support the Identification and Justification of MAP-21 and FAST Act Investments**

The goal of this project is to examine data gaps, related MAP-21 and FAST act requirements, along the Oregon Freight Plan freight strategic network. Data sources will be compiled and analyzed regarding quality and coverage. This project will: (1) identify and map data gaps, (2) study how existing data sources can be integrated to answer MAP-21 requirements, and (3) analyze how data gaps can be addressed in the near-future.

**RAC discussion:** Due to the Freight Plan is to be updated in order to obligate freight funds by December 4, 2017 and having a similar project underway in the Planning Unit there is an overall feeling of the necessity of this project and what type of actual research would be involved.

### **Construction, Pavements and Materials (CPM) – Norris Shippen**

The ETG ranking of this year's Construction, Pavements and Materials Stage 2's were 17-009 first and 17-068 second.

### **17-009 Improved Laboratory Density Testing for Roadway Base and Retaining Wall Backfill Materials**

The objective of the proposed research is to develop ODOT Test Methods for compaction specification of unbound and cement-treated aggregate materials. Based on ODOT's current challenges, two complimentary research questions should be answered: (1) What is the appropriate procedure for laboratory characterization of the moisture-density relationship for granular materials?; and (2) What are the effects of changing moisture content and gradation on the compaction and performance of in-place cement treated base (iCTB)? The objectives will be achieved through a systematic laboratory study coordinated with the ODOT Technical Advisory Committee.

**RAC discussion:** There is a concern whether this is the right time for this project.

### **17-068 Employing iRLPD Test Methods for Optimal Asphalt Mixture Performance**

A new testing methodology called incremental Repeated Load Permanent Deformation (iRLPD) has been developed. The optimal design concept would prevent making the mixtures too stiff. The iRLPD tests may be utilized to determine how much a mixture can be stiffened before it loses its durability and become vulnerable to cracking. The Optimal design tool may also be used to modify mix design when the quality of RAP changes during the production so that the mixture remains within the acceptable performance range.

**RAC discussion:** Although this may become an AASHTO standard, for Oregon purposes the project should run tests to see if a lot of cracking will result from use of the recycled material added to the asphalt.

## **Geotechnical, Hydraulics and Environmental (GHE) – Kira Glover-Cutter**

The ETG ranking of this year's Geotechnical, Hydraulics and Environmental Stage 2's were 17-013 first and 17-018 second.

### **17-013 Analysis of Highway System Impacts on TMDL Watersheds using the FHWA Stochastic Empirical Loading and Dilution Model (SELDM)**

The proposed research project aims to expand the usefulness of SELDM to watershed level analysis. The procedures to be developed will allow the practitioner to determine both the total and relative pollutant loading attributable to highway sources at any point on a watershed's stream network. Most importantly, expanded SELDM will be used to analyze the effects and benefits of various stormwater treatment facilities and strategies in the watershed in order to: (1) optimize BMP site selection for increased environmental uplift while reducing program stormwater treatment costs, (2) determine more realistic estimations of ODOT specific pollutant loading and contribution relative to total in-stream pollutant concentration, and (3) prepare ODOT for anticipated stormwater permit requirements through use of a strategic and focused planning tool. Specifically, the objectives of this proposed study are to:

1. Develop techniques and protocols for SELDM scale-up. The newly optimized SELDM model will enable impact analysis of water quality from multiple highway discharge points in a watershed as well as from specific points within the watershed.
2. Demonstrate SELDM scale-up protocols using empirical data from Oregon watersheds with highway runoff pollutant related TMDLs and multiple highway discharge points.
3. Develop a guidance manual and final report for watershed level analyses using SELDM, based on the results and experience gained in step 2.

**RAC discussion:** The use of available tools is a big plus for this project. The project would be groundbreaking nationally and can be applied and useful to other DOTs. The timeline is a little aggressive, but even if the project does go on a little longer, it will not affect the budget.

### **17-018 Coastal Landslide and Bluff Retreat Monitoring for Climate Change Adaptation and Targeted Risk Assessment**

The goal of this research for ODOT is to develop a more comprehensive data driven framework for prioritizing coastal asset management. This is new research for ODOT building upon recent smaller-scale foundational efforts and recommendations. The objectives of this project include the following tasks:

1. Select 5 representative sites reflecting a combination of coastal geologic terrains, landslide types, and coastal bluff erosion activities.
2. Determine current geotechnical and hydrological data, as well as landslide and bluff geometry and movement using traditional and new 3D technologies such as LiDAR and real-time remote sensing.
3. Biannually quantify changes in landslide movement, groundwater change, and bluff erosion rates over a 7 year timeline to fully capture the episodic nature of sea cliff erosion in the context of climate events.
4. Document observed and quantified changes with mid-project report at year 3. A final comprehensive report prepared for ODOT at the end of the monitoring study at year 7 is expected.
5. Develop GIS/LiDAR based management framework for targeted risk assessment and climate change adaptation planning including guidelines for future evaluations of coastal infrastructure sites.

**RAC discussion:** The project is scalable and can be reduce from 7 years/5 sites to 5 years/3 sites. Sites will be selected based on representation. There is a letter of support from the Parks and Recreation Department and Land Conservation and Development for this project.

### **Maintenance and Operations (MO) – Jon Lazarus**

The ETG ranking of this year's Maintenance and Operations Stage 2's were 17-003 first, 17-042 second, and 17-051 third.

#### **17-003** Guidelines for Using Sacrificial Coatings to Protect ODOT Equipment Assets from Deicer Corrosion

The goal of this project is to develop guidelines for ODOT to adopt the cost-effective sacrificial coating treatments to reduce the corrosion effects of deicers to ODOT equipment assets and extend their service life.

**RAC discussion:** The general discussion circled around the use of magnesium chloride as a deicer and the corrosion factor affecting the equipment. Questions of what other states use and why ODOT doesn't consider those products were explained.

#### **17-042** Lidar for Maintenance of Pavement Reflective Markings and Retro-Reflective Signs

Recent research has investigated the potential use of mobile lidar for retro-reflectivity evaluation (Olsen et al. 2013; Ai and Tsai 2016). While this work appears promising, detailed studies are needed to assess the operational feasibility of these methods for state DOTs and to develop production-ready procedures. Additionally, since some aspects of the lidar intensity calibration are system-specific, it is important to modify and test these procedures using data from ODOT's system. In light of these research needs, this study seeks to:

1. Develop a model for retro-reflectivity and radiometric calibration for ODOT's mobile lidar system.
2. Generate a set of quality control metrics for pavement marking and sign retro-reflectivity based on information derived from mobile lidar data.
3. Establish procedures for creating GIS data layers from the output of the above steps to support decision making by supervisors and integrate analysis results into ODOT's overall workflows.

**RAC discussion:** For clarification - the GIS is not part of this scope. Using the mobile lidar data would be safer due to fewer employees out on the roadside. One consensus is that this research would pay for itself within two years. The data is already being captured for other purposes, but now the research wants to figure out how to use that data for this application.

#### **17-051** A Comparative Study of Materials for Concrete Patch Repair

The objectives of this project are to: (1) develop quantifiable information to compare the performance between different repair materials in field and laboratory investigations; (2) refine criteria to identify other acceptable sources for repair materials for the qualified products list (QPL); and (3) improve current specification and guidance to ensure successful application and performance of repair materials.

**RAC discussion:** No discussion or questions arose for this project.

## **Planning and Economic Analysis (PEA) – Tony Knudson**

The ETG ranking of this year's Planning and Economic Analysis Stage 2's were 17-031 first, and 17-056 second.

### **17-031 A Method to Estimate Average Annual Daily Traffic for Minor Facilities for MAP-21 Reporting and Statewide Safety Analysis**

The objectives of this project are to: (i) identify data needs for estimating missing AADT information, (ii) develop a cost-effective method to estimate AADT for all minor facilities across the state of Oregon, regardless of jurisdictional ownership, (iii) conduct a pilot demonstration of the method to estimate missing AADT information in ODOT Region 2, and (iv) analyze the performance of the method and provide recommendations on future research directions and potential data to be collected to improve the accuracy of the AADT estimation.

**RAC Discussion:** To quantify this particular project it was brought up that the need is because it is a Federal reporting requirement and for safety prioritization and it will become more important in the near future and traffic counting is very expensive.

### **17-056 Develop Methods and Data to Identify Transportation Disadvantage in Oregon**

The goal of the proposed project is to develop a methodology and baseline assessment suitable for use in future planning and project development activities throughout the state. To achieve this, we plan to review existing guidance and best practices, review ODOT efforts, explore available data sources, assess statewide contributors to and distribution of transportation disadvantage, and provide analytic tools that could be used in future planning, project development, and investment efforts.

**RAC discussion:** The project did not present the critical need and be very specific within the statement of works so it will convey the message to the committee. It is very vague. It was suggested that this project can come back next year with more understanding of the problem and scope.

## **Structures (ST) – Matthew Mabey**

The ETG ranking of this year's Structures Stage 2's were 17-023 first, and 17-025 second.

### **17-023 Performance of High-Strength Steel Reinforcement in Shear Friction Applications (focuses on new construction)**

The objective of this research is to evaluate and define the performance of A706 Grade 80, ASTM A615 Grade 100, and ASTM A1035 (120 ksi) reinforcing steel performance in shear friction applications. Understanding the performance is crucial for evaluating and assessing the applicability of the current design equations for RC structures using HSS reinforcement. If successful, the research will provide necessary data for supporting a recent working agenda item (WAI) presented to the AASHTO-T10 committee by Oregon DOT.

### **17-025 Seismic Performance Design Criteria for Bridge Bents Considering CSZ Demands (focuses on existing bridges)**

The main objective of this research is to quantify the steel and concrete strain limits to be used for the seismic assessment of bridge bents considering the operational performance design criteria of existing reinforced concrete bridge bents. Multi-column bents are typical for bridges in Oregon and are therefore more representative of the need to gather performance related data. The proposed research is for experimentally evaluating large-scale reinforced concrete subassemblies representing critical parts of the bents. These primarily represent column-to-crossbeam and column-to-foundation aspects of the bent. Of key interest from the experiments are the monitoring of material strains and deformations as the column reaches target seismic performance levels.

**RAC discussion:** What drives the cost on the high-strength steel is the building and breaking of stuff to test it. There was also discussion on what drives the duration of the projects, which is when grad students are available and the construction season.

### **Traffic Safety and Human Factors (TSHF) – Mark Joerger**

The ETG ranking of this year's Traffic Safety and Human Factors Stage 2's were actually ranked even 17-019 and 17-021.

#### **17-019 Best Practices for Installation of Rectangular Rapid Flash Beacons (RRFB) with and without Median Refuge Islands**

This research will seek to produce the guidance that practitioners need about the placement of RRFB beacons in combination with median refuges on three land roadways. This research will provide empirical evidence about the effect of refuge medians on driver yielding and pedestrian crossing behavior. The research will also compare the effect of median-mounted RRFB displays versus far-side-mounted RRFB displays with respect to these same performance measures.

#### **17-021 Quantifying the Performance of Low-Noise Rumble Strips**

The proposed study will evaluate the feasibility of using sinusoidal as a substitute for traditional milled rumble strips on highway segments with lane departure crash problems. A quantitative and empirical comparison of the in-vehicle noises and vibrations and roadside noises of sinusoidal and traditional rumble strips will give an indication as to whether the sinusoidal pattern can potentially be used as a substitute for the traditional pattern in areas with lane crash problems.

**RAC discussion:** Regarding the "rumble strips" (17-021) the areas of study covers the reduction of the noise to the neighbors and the noticeability to the drivers. There is also a concern about some rumble strips are better for bicyclists and some are not.

In 17-019, a question about the significance of the Rapid Flash Beacon as to whether there should be median refuge islands was raised. The Rapid Flash Beacon has been successful about getting the driver's attention and properly yield at crosswalks and the median refuge islands were included when there is two-way traffic.

The RAC members will submit the revised ballots and Mark Joerger will record the revisions.

After all the revisions were made a tie was discovered at the breaking point for which project moves forward or not. The tie was between "Compliance and Surrogate Safety Measures for Uncontrolled Crosswalk Crossings in Oregon" and "Coastal Landslide and Bluff Retreat Monitoring for Climate Change Adaptation and Targeted Risk Assessment."

The RAC decided that the Crosswalk Crossings will be in the 9<sup>th</sup> place and the Landslide will be in the 10<sup>th</sup> place. This does not mean that the Landslide project will not move forward, but if there are not enough funds, then the Crosswalk Crossings will move forward.

The chart on the following page is how the RAC ranked the Stage Two projects.

Scott Ashford has announced his withdrawal from the RAC.

The meeting was concluded at 4:20 p.m.

17-013	Analysis of Highway System Impacts on TMDL Watersheds using SELDM	GHE
17-042	Lidar for Maintenance of Pavement Reflective Markings and Retro-Reflective Signs	MO
17-021	Quantifying the Performance of Low-Noise Rumble Strips	TSHF
17-068	Employing iRLPD Test Methods for Optimal Asphalt Mixture Performance	CPM
17-025	Seismic Performance Design Criteria for Bridge Bent Plastic Hinge Regions	ST
17-036	Statewide Data Standards to Support Current and Future Strategic Public Transit	AST
17-031	A Method to Estimate Average Annual Daily Traffic for Minor Facilities for MAP-21...	PEA
17-023	Performance of High-Strength Steel Reinforcement in Shear Friction Applications	ST
17-038	Compliance and Surrogate Safety Measures for Uncontrolled Crosswalks in Oregon	AST
17-018	Coastal Landslide and Bluff Retreat Monitoring for Climate Change Adaptation	GHE
17-019	Installation of Rectangular Rapid Flash Beacons with and without Median Refuge Islands	TSHF
17-051	A Comparative Study of Materials for Concrete Patch Repair	MO
17-009	Improved Laboratory Density Testing for Roadway Base and Retaining Wall Backfill...	CPM
17-056	Develop Methods and Data to Identify Transportation Disadvantage in Oregon	PEA
17-003	Using sacrificial coatings to protect ODOT equipment assets from deicer corrosion	MO
17-039	Freight Data to Support Identification and Justification of MAP-21 & FAST Act Investments	AST